WHAT IS CLAIMED IS:

1. A radio frequency amplifier system comprising:

a delta sigma modulator connected to receive an input signal and produce a bi-level modulation signal;

a switching mode power amplifier driven by the bi-level modulation signal and having an output; and,

a linearizer connected to supply a corrective signal at a location prior to the switching mode power amplifier.

2. The radio frequency amplifier system of claim 1 wherein the delta sigma modulator comprises a bandpass delta sigma modulator.

3. The radio frequency amplifier system of claim 2 wherein the bandpass delta sigma modulator comprises a multi-band bandpass delta sigma modulator.

4. The radio frequency amplifier system of claim 3 comprising a tunable output filter coupled to the output of the amplifier.

5. The radio frequency power amplifier system of claim 1 wherein the delta sigma modulator comprises:

a digital-to-analog converter coupled to receive a signal from an output of a first resonator circuit and present the digitized signal at an output of the delta sigma modulator,

a second resonator circuit having an input coupled to receive an input signal and an output coupled to the input of the first resonator circuit, and

an analog-to-digital converter coupled to receive the digitized signal, generate a re-created analog signal from the digitized signal, and combine the recreated analog signal with signals at the inputs of each of the first and second resonator circuits.

6. The radio frequency amplifier system of claim 1 wherein the switching mode power amplifier comprises a class S amplifier.

7. The radio frequency amplifier system of claim 1 wherein the switching mode power amplifier comprises a class D amplifier.

8. The radio frequency amplifier system of claim 1 comprising an extended interface between the delta sigma modulator and the switching mode power amplifier, the extended interface carrying the bi-level modulation signal.

9. The radio frequency amplifier system of claim 7 wherein the extended interface comprises a first coupler circuit coupling the bi-level modulation signal to a transmission medium and a second coupling circuit coupling the bi-level modulation signal to the switching mode power amplifier.

9. The radio frequency amplifier system of claim 8 wherein the transmission medium comprises an optical transmission medium, the first coupling circuit comprises an electro-optical coupler and the second coupling circuit comprises an opto-electrical coupler.

10. The radio frequency amplifier system of claim 6 wherein the optical transmission medium comprises an optical fiber.

11. The radio frequency amplifier system of claim 8 wherein the transmission medium comprises a microwave radio link, the first coupling circuit comprises a high speed digital modulator and the second coupling circuit comprises a high speed digital demodulator.

12. The radio frequency amplifier system of claim 8 wherein the transmission medium comprises a path through signal carriers of a cable television system, the first coupling circuit comprises a high speed digital modulator and the second coupling circuit comprises a high speed digital demodulator.

13. The radio frequency amplifier system of claim 8 wherein the transmission medium comprises a coaxial cable.

14. The radio frequency amplifier system of claim 8 wherein the extended interface is bidirectional.

15. The radio frequency power amplifier system of claim 8 wherein the first and second coupling circuits are separated by a distance of at least 10 meters.

16. The radio frequency amplifier system of claim 8 wherein the first and second coupling circuits are separated by a distance of at least 500 meters.

17. The radio frequency amplifier system of claim 8 wherein the linearizer circuit generates the corrective signal at least in part from a feedback signal from an output of the switching mode power amplifier and the feedback signal is carried on the extended interface.

18. The radio frequency amplifier system of claim 17 comprising a power monitor coupled to the output of the switching mode power amplifier wherein the feedback signal comprises a signal carrying information regarding a power level detected by the power monitor.

19. The radio frequency amplifier system of claim 18 wherein the linearizer is configured to generate a predistortion signal based upon the feedback signal and the corrective signal is based upon the predistortion signal.

20. The radio frequency power amplifier system of claim 1 wherein the linearizer circuit is configured to generate the corrective signal through one or more of: feed forward; analog predistortion; digital predistortion;

adaptive digital predistortion; predistortion and feed forward; and adaptive feedforward.

21. The radio frequency power amplifier system of claim 1 having a passband at a frequency in excess of 300 kHz.

22. The radio frequency power amplifier system of claim 1 having a passband at a frequency in excess of 800MHz.

23. The radio frequency power amplifier system of claim 1 wherein the output of the switching mode power amplifier is coupled to an antenna, the switching mode power amplifier is located within 2 meters from the antenna and the delta sigma modulator is located more than 5 meters from the antenna.

24. The radio frequency power amplifier system of claim 1 comprising a harmonic filter connected at the output of the switching mode power amplifier.

25. The radio frequency power amplifier system of claim 5 wherein the class S amplifier comprises two electronic switching devices in a totem pole configuration.

26. The radio frequency power amplifier system of claim 5 wherein the output of the class S amplifier comprises first and second terminals and the class S amplifier comprises first and second switching devices

connected in series with one another, the first switching device coupled between the first terminal and a first conductor, the second switching device coupled between the first terminal and a second conductor maintained at a second voltage relative to the first conductor by a power supply, and second and third switching devices connected in series with one another, the second switching device coupled between the first conductor and the second terminal, the fourth switching device coupled between the second terminal and the second conductor.

27. The radio frequency power amplifier system of claim 1 wherein the switching mode power amplifier has an adjustable output power.

28. The radio frequency power amplifier system of claim 27 wherein the switching mode power amplifier comprises an electronically variable voltage bias power supply and a mechanism connected to vary the voltage of the bias power supply and thereby vary the output power of the switching mode power amplifier.

29. The radio frequency power amplifier system of claim 27 wherein the switching mode power amplifier comprises a plurality of parallel-connected amplification circuits and a mechanism connected to adjust the output power by varying a number of the amplification circuits which are active by selectively enabling or disabling some of the amplification circuits.

30. The radio frequency power amplifier system of claim 29 wherein each of the amplification circuits comprises an electronically variable voltage bias power supply and a mechanism connected to vary the voltage of the bias power supply and the amplification circuits are enabled and disabled by varying the voltaged of the corresponding bias power supply.

31. The radio frequency power amplifier system of claim 20 comprising a mechanism for adjusting the output power of the switching mode power amplifier in response to a channel count, a channel link loss parameter or both a channel count and a channel link loss parameter.

32. The radio frequency power amplifier system of claim 1 wherein the delta sigma modulator comprises a multiband bandpass delta sigma modulator capable operating in two or more frequency bands simultaneously.

33. The radio frequency power amplifier system of claim 32 comprising a multiband programmable variable tuning output filter connected to filter a signal amplified by the switching mode power amplifier.

34. The radio frequency power amplifier system of claim 7 wherein the switching mode power amplifier is coupled to an antenna, the antenna and switching mode power amplifier are both on a tower and the delta sigma modulator is not located on the tower.

35. The radio frequency power amplifier system of claim 1 comprising a power supply connected to supply electrical power to the switching mode power amplifier wherein the power supply comprises a solar panel.

36. The radio frequency power amplifier system of claim 1 comprising a power supply connected to supply electrical power to the switching mode power amplifier wherein the power supply comprises a wind generator.

37. The radio frequency power amplifier system of claim 36 wherein the power supply comprises an electrical storage cell charged by the wind generator and a dc-dc step-up converter connected to receive power from the storage cell at a voltage of the storage cell and provide the power to the switching mode power amplifier at an increased voltage greater than the voltage of the storage cell.

38. A radio frequency transmission system comprising:

a modulator producing a bi-level modulation signal,

an extended interface connected to carry the bi-level modulation signal, and

an amplifier, the amplifier connected to receive and amplify the bi-level modulation signal.

39. The radio frequency transmission system of claim 38 wherein the extended interface comprises a first coupler circuit coupling the bi-level modulation signal to a transmission medium and a second coupling circuit coupling the bi-level modulation signal to the amplifier.

40. The radio frequency transmission system of claim 39 wherein the transmission medium comprises an optical transmission medium, the first coupling circuit comprises an electro-optical coupler and the second coupling circuit comprises an opto-electrical coupler.

41. The radio frequency transmission system of claim 40 wherein the optical transmission medium comprises an optical fiber.

42. The radio frequency transmission system of claim 39 wherein the transmission medium comprises a microwave radio link, the first coupling circuit comprises a high speed digital modulator and the second coupling circuit comprises a high speed digital demodulator.

43. The radio frequency transmission system of claim 39 wherein the transmission medium comprises a path through signal carriers of a cable television system, the first coupling circuit comprises a high speed digital modulator and the second coupling circuit comprises a high speed digital demodulator.

44. The radio frequency transmission system of claim 39 wherein the transmission medium comprises a coaxial cable.

45. The radio frequency transmission system of claim 39 wherein the extended interface is bidirectional.

46. The radio frequency transmission system of claim 45 comprising a single transmission medium carrying bidirectional signals.

47. The radio frequency transmission system of claim 45 comprising a plurality of transmission media each carrying unidirectional signals.

48. The radio frequency transmission system of claim 45 comprising a linearizer configured to generate a corrective signal at least in part from a feedback signal from an output of the amplifier wherein the feedback signal is carried to the linearizer on the extended interface.

49. The radio frequency transmission system of claim 48 comprising a power monitor coupled to the output of the amplifier wherein the feedback signal comprises a signal carrying information regarding a power level detected by the power monitor.

50. The radio frequency transmission system of claim 49 wherein the linearizer is configured to generate a predistortion signal based upon the feedback signal and the corrective signal is based upon the predistortion signal.

51. The radio frequency transmission system of claim 39 wherein the first and second coupling circuits are separated by a distance of at least 10 meters.

52. The radio frequency transmission system of claim 39 wherein the first and second coupling circuits are separated by a distance of at least 500 meters.

53. The radio frequency transmission system of claim 38 wherein the modulation signal comprises a pulse density modulated signal.

54. The radio frequency transmission system of claim 53 wherein the modulator comprises a delta sigma modulator.

55. The radio frequency transmission system of claim 38 comprising a linearizer, the linearizer generating a corrective signal in response at least in part to a feedback signal carried to the linearizer on the extended interface.

56. The radio frequency transmission system of claim 38 wherein the amplifier comprises a switching mode power amplifier.

57. The radio frequency transmission system of claim 56 wherein the amplifier comprises a class S amplifier.

58. The radio frequency transmission system of claim 56 wherein the amplifier is configured to provide a plurality of selectable power output levels.

59. The radio frequency transmission system of claim 58 comprising a power requirement determination mechanism connected to control the amplifier by selecting one of the power output levels in response to a power requirement determined by the power requirement determination mechanism.

60. The radio frequency transmission system of claim 38 wherein the modulator and amplifier are supplied by separate power supplies.

61. The radio frequency transmission system of claim 60 wherein the amplifier is supplied by a power supply comprising a solar panel.

62. The radio frequency transmission system of claim 61 wherein the power supply comprises an electrical storage cell charged by the solar cell and a dc-dc step-up converter connected to receive power from the storage cell at a voltage of the storage cell and provide the power to the amplifier at an increased voltage greater than the voltage of the storage cell.

63. The radio frequency transmission system of claim 60 wherein the amplifier is supplied by a power supply comprising a wind generator.

64. The radio frequency transmission system of claim 63 wherein the power supply comprises an electrical storage cell charged by the wind generator and a dc-dc step-up converter connected to receive power from the storage cell at a voltage of the storage cell and provide the power to the

amplifier at an increased voltage greater than the voltage of the storage cell.

65. The radio frequency transmission system of claim 60 wherein the amplifier is coupled to an antenna and is located at the antenna and the modulator is located at least 10 meters from the antenna.

66. The radio frequency transmission system of claim 60 wherein the modulator is located at least 500 meters from the antenna.

67. The radio frequency transmission system of claim 38 comprising a plurality of modulators and a plurality of corresponding amplifiers wherein the extended interface carries a modulation signal from each of the modulators to each of the amplifiers.

68. The radio frequency transmission system of claim 67 wherein the plurality of amplifiers are each associated with a sector of a multi-sectored antenna.

69. The radio frequency transmission system of claim 67 wherein the plurality of amplifiers are each associated with an element in a phased antenna array.

Figs 7A, 7B ≅ claim 38

70. A method for relaying a radio frequency signal comprising;

receiving a radio frequency signal at a receiver located at a first end of an extended interface;

right hand

side of 7A (84)

transferring the radio frequency signal to a modulator at a second end of the extended interface by way of the extended interface;

creating a modulation signal based on the radio frequency signal;

transferring the modulation signal to the first end of the extended interface by way of the extended interface;

amplifying the modulation signal; and,

transmitting the amplified modulated signal.

71. The method of claim 70 wherein the extended interface has a length exceeding 10 meters and transferring the radio frequency signal to the modulator comprises digitizing the radio frequency signal, performing an electrical to optical conversion on the radio frequency signal, carrying the radio frequency signal over an optical fiber and performing an optical to electrical conversion to recover the digitized radio frequency signal.

72. The method of claim 71 comprising supplying electrical power for creating the modulation signal from a mains power supply and supplying electrical power for amplifying the modulation signal from a non-mains electrical power supply.

73. The method of claim 72 wherein supplying electrical power for amplifying the modulation signal from a non-mains electrical power supply comprises generating electrical power from solar energy or wind energy or both solar and wind energy.

74. The method of claim 70 comprising obtaining a feedback signal at the first end of the extended interface, transmitting the feedback signal to the second end of the extended interface by way of the extended interface, generating a corrective signal, and combining the corrective signal with the radio frequency signal.

Fig 9A,9B

75. A microwave transmission method comprising

converting an analog microwave signal into a binary two-level signal capable of driving a switching mode amplifier; and,

driving a switching mode amplifier with the binary two-level signal.